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ADVANCED | STRATEGIC FINANCIAL MANAGEMENT

MONEY (RUPEE) WEIGHTED RATE OF RETURN (MWROR) TIME WEIGHTED RATE OF RETURN (TWROR)

Only for CMA Students.

Question No. 17A

Fund A has the following market value at the end of some successive years.

Period (Years)	Market Value (₹)	Cash Flows (net) (₹)
0	1,000	-
1	1,100	100
2	1,200	150
3	1,300	80
4	1,500	-

Calculate Money Weighted Rate of Returns & Time-weighted Rate of Return.

[\[CMA-SM22\]](#)

Ans: 18.6%; 15.14%

Question No. 17B

Shares of ABC Ltd. Pay a dividend of ₹ 2.00 at the end of March every year. An investor buys 2 shares of the stock on January 1 at a price of ₹20.00, sells one of those shares for ₹22.00 a year later on January 1, and sells the second share at the end of the 2nd year at ₹19.00 per share. Find the time and rupee weighted rates of return on the 2-year investment.

[\[CMA-SM22\]](#)

Ans: 11.91%; 7.75%

TEST YOUR KNOWLEDGE

Question No. 17.1

A mutual fund starts the year with ₹50 million. By mid-year it has appreciated to ₹60 million, at which point it pays out cash amounting to ₹20. In the second half of the year, the fund appreciates by another 50%.

- What is the annual TWROR?
- What is the annual MWROR?
- Suppose that the fund has a mid-year cash inflow of ₹ 20 million rather than an outflow. Would this increase or reduce the TWROR?

[\[CMA-SM22\]](#)

Ans: 226%; 260%; 80%

Question No. 17.2

The following table gives details of the market of infra fund of a portfolios manager during the year along with the value of cash flows into the fund.

Time (Years)	Market Value of Infra Fund	Cash Flows
1/4	93	+5
1/2	99	+2
3/4	105	+7
1	115	-

The value of the fund at the beginning was ₹ 90 crores.

You are required to calculate:

- Money weighted rate of return;
- Time weighted rate of return.
- Which of the above two methods should be used for assessment of the performance of a portfolio manager? Justify.

[\[CMA-SM22\]](#)

Ans: 11.42%; 11.43%

money weighted rate of return (MWROR)

Time weighted rate of return (TWROR)

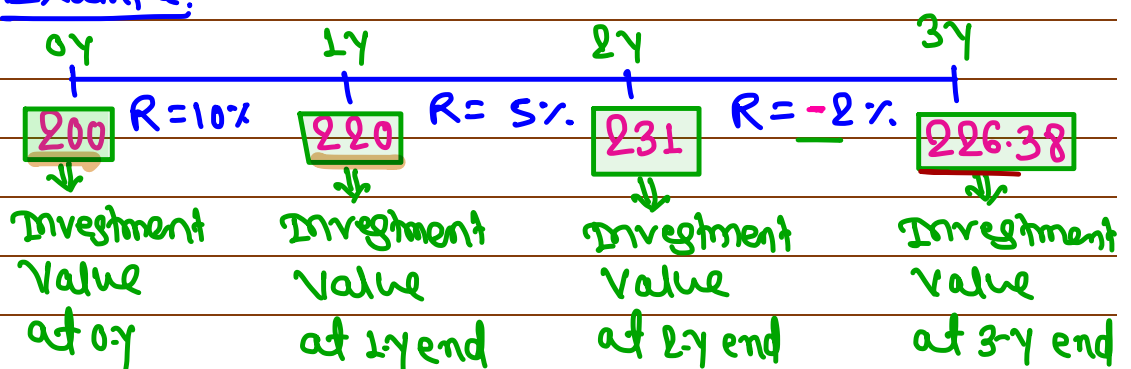
only for CMA Students:

(A) money weighted rate of return (MWROR)

- MWROR is simply the compounded rate of return (or, IRR) over the given period.
- we have already studied it in detail in Time Value chapter.
- To calculate compounded return we need to use interpolation technique.

(B) Time weighted rate of return (TWROR)

- In this method, we calculate return of every period separately and then combined using geometric compounding (multiplying them together).
- Example:



$$\bullet \text{ Return year-1} = \frac{220 - 200}{200} \times 100 = 10\%$$

$$\bullet \text{ Return year-2: } \frac{231 - 220}{220} \times 100 = 5\%$$

$$\bullet \text{ Return year-3} = \frac{226.38 - 231}{231} \times 100 = -2\%$$

Suppose, $\text{TwRoR} = i\%$.

Then,

$$(1+i) = (1+0.10) \times (1+0.05) \times (1-0.02)$$

$$\therefore i = (1.1319 - 1) = 0.1319 \text{ (i.e. 13.19\%)}$$

Analysis:

$$\textcircled{*} \frac{\text{value at 1y end}}{\text{value at 0y}} = [1 + \% \text{Return of year-1}]$$

in decimal

$$\text{i.e. } \frac{220}{200} = 1.10$$

$$\textcircled{*} \frac{\text{value at 2y end}}{\text{value at 1y end}} = [1 + \% \text{Return of year-2}]$$

in decimal

and so on.....

Hence we can calculate mWRoR as follows:

$$(1+i) = \left[\frac{220}{200} \times \frac{231}{220} \times \frac{226.38}{231} \right]$$

$$= 1.1319$$

$$\therefore i = 1.1319 - 1 = 0.1319 \text{ (i.e. 13.19\%)}$$

Which method is best ?

MWROR (i.e. IRR) is suitable for an individual fund's performance but not suitable for measuring the performance of a fund manager.

TWROR is suitable for measuring the performance of a fund manager.

Disclaimer:

CMA institute concept on TWROR is not correct. But prefer institute solution.

CMA Institute calculated return of whole investment period which is meaning less & not comparable with other investment.

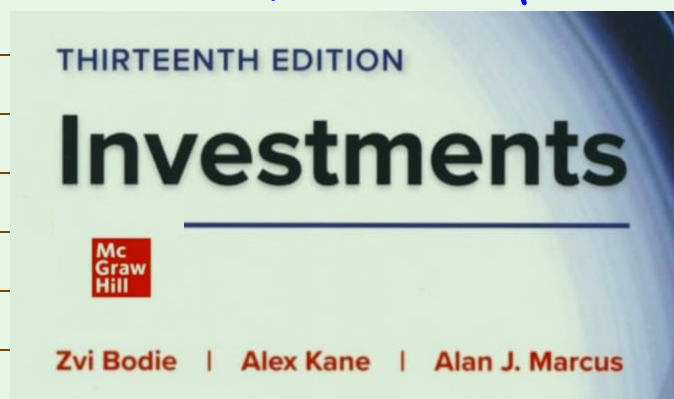
correct calculation:

Return should be in annualised term (i.e. per annum term).

Hence,

$$(1+i)^n = (1+R_1) \times (1+R_2) \times (1+R_3) \times \dots$$

This concept is supported by book:



Q-17A

0	1	2	3	4
1000	1100	1200	1300	1500
	100	150	80	
	<u>1200</u>	<u>1350</u>	<u>1380</u>	

(i) money weighted rate of return (MWROR):

Rough work: Total investment = 1330
 (Not for exam) Total ending val = 1500
 Return = $\frac{1500 - 1330}{1330} \times 100 = 12.78\%$ (i.e. 3.2% pa.)
 for 4y

Assume, compounded return = $i\%$.

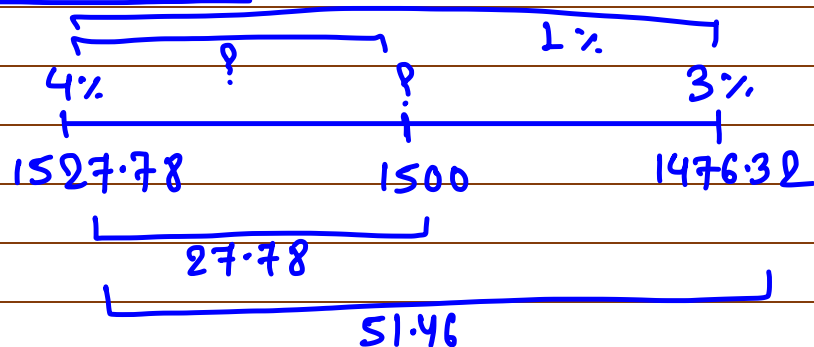
$$1000 \times (1+i)^4 + 100 \times (1+i)^3 + 150 \times (1+i)^2 + 80 \times (1+i) = 1500$$

Assume, $i = 4\%$

$$1000 \times (1+0.04)^4 + 100 \times (1+0.04)^3 + 150 \times (1+0.04)^2 + 80 \times (1+0.04) = 1527.78$$

Again assume, $i = 3\%$

$$1000 \times (1+0.03)^4 + 100 \times (1+0.03)^3 + 150 \times (1+0.03)^2 + 80 \times (1+0.03) = 1476.32$$

using interpolation:

$$51.46 \Rightarrow 1\%$$

$$27.78 \Rightarrow \frac{1}{51.46} \times 27.78 = .54\%$$

$$\therefore i = 4\% - .54\% = 3.46\%$$

Hence money weighted rate of return = 3.46%

(ii) Time weighted rate of return (TWROR):

$$(1+i) = \frac{1100}{1000} \times \frac{1200}{1200} \times \frac{1300}{1350} \times \frac{1500}{1380}$$

$$\therefore i = 1.1514 - 1 = .1514 \text{ (i.e. 15.14\%)} \text{ Ans}$$

Disclaimer:

According to ICAI study material MWROR is 18.6% which is not correct.

Solution:

Money Weighted Rate of Returns is actually internal rate of return. It is calculated as follows:

$$1000(1+i)^4 + 100(1+i)^3 + 150(1+i)^2 + 80(1+i) = 1500$$

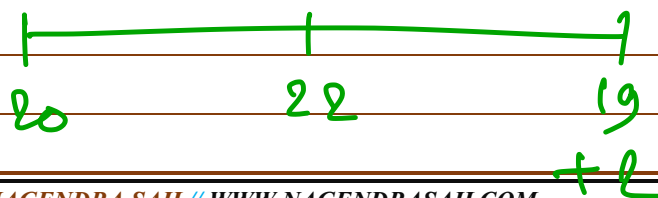
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Strategic Financial Management

By using the iterative process and substituting different values for 'i', it is found that 'i' lies between 18% and 19%. By using the technique of interpolation, it is found that the true value of 'i' is 18.60%. Hence, the MWROR for the fund is 18.6%. MWROR is a satisfactory measure of the individual fund's performance taken in isolation. But as a test of fund manager's investment skill, it is not meaningful as it is strongly influenced by the timing and magnitude of the cash flows, which are often beyond the control of the fund manager.



Q. 17B

0Y	1Y	2Y
-40	+4	+2
	+22	+19
	<u>26</u>	<u>21</u>

(i) Time weighted rate of return:

$$\text{Year-1 return} = \frac{(2 + 22) - 20}{20} \times 100 = 20\%$$

$$\text{Year-2 return} = \frac{(2 + 19) - 22}{22} \times 100 = -4.55\%$$

$$(1+i) = (1+0.20) \times (1-0.0455)$$

$$\therefore i = 1.1454 - 1 = .1454 \quad \boxed{\text{i.e. } 14.54\%} \quad \underline{\text{Ans}}$$

Disclaimer:

ICMAI calculated TWRR using simple average of 20% & -4.55%, which is less appropriate as TWRR should ideally use geometric linking.

In all other questions ICMAI used geometric linking of return not simple average. ICMAI sol = $\frac{20 - 4.55}{2} = 7.725\%$

Second alternative:

$$(1+i) = \frac{24}{20} \times \frac{21}{22}$$

$$\therefore i = (1.1455 - 1) = .1455 \quad \boxed{\text{i.e. } 14.55\%} \quad \underline{\text{Ans}}$$

(ii) Rupee weighted rate of return

$$\frac{26}{(1+i)^1} + \frac{21}{(1+i)^2} = 40$$

Assume, $i = 15\%$

$$\frac{26}{(1+0.15)^1} + \frac{21}{(1+0.15)^2} = 38.49$$

Again assume, $i = 13\%$

$$\frac{26}{(1+0.13)^1} + \frac{21}{(1+0.13)^2} = 39.45$$

Again assume, $i = 12\%$

$$\frac{26}{(1+0.12)^1} + \frac{21}{(1+0.12)^2} = 39.96 \text{ (i.e. 40)}$$

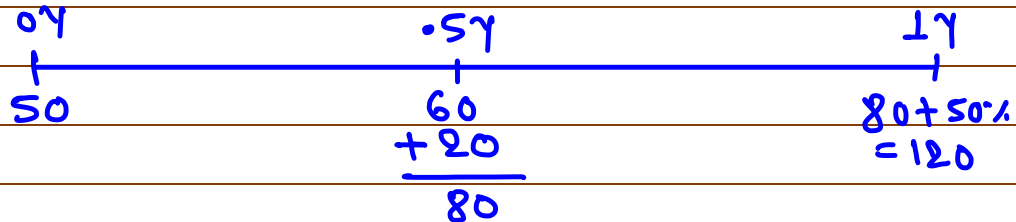
Hence, MWROR = 12% Ans

Note: If you do not want to do rounding off of 4 paise then assume one more rate below 12% and then do interpolation.

Q-17.1Disclaimer:

• IN solution, ICMAT assumed, 20 mill inflows at mid of the year.

• modification is question: "~~pay out~~" "Receives"



(a) TWROR (Time weighted rate of return)

$$(1+i) = \frac{60}{50} \times \frac{120}{80} = 1.80$$

$$\therefore i = (1.80 - 1) = .80 \quad \text{[i.e. 80\%]}$$

(b) mWROR:

Assume, mWROR = i (for 6m)

$$50 \times (1+i)^2 + 20 \times (1+i) = 120$$

Rough calculation:

$$\text{Investment} = 50 + 20 = 70$$

$$\text{value at end} = 120$$

$$\text{Return} = \frac{120 - 70}{70} \times 100 = 71.43\% \text{ for 1 year}$$

(i.e. 35.71% for 6m)

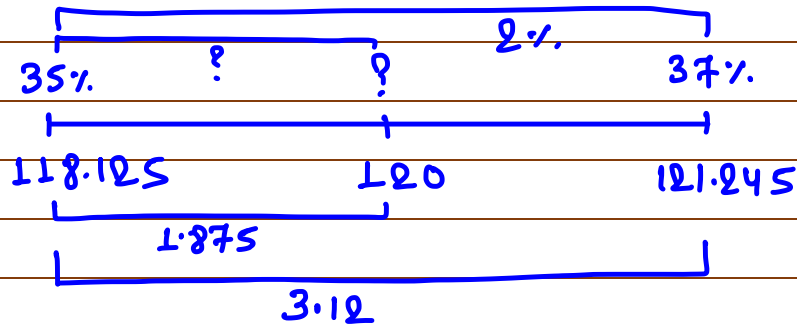
Assume $i = 35\%$.

$$50 \times (1 + .35)^2 + 20 \times (1 + .35) = 118.125$$

Again assume, $i = 37\%$.

$$50 \times (1 + .37)^2 + 20 \times (1 + .37) = 121.245$$

using interpolation:



$$3.12 \Rightarrow 2\%$$

$$1.875 \Rightarrow \left(\frac{2}{3.12} \times 1.875 \right) = 1.20\%$$

Hence, $MWROR = 35\% + 1.20\% = 36.2\%$ p.a.
compounded semi ann.

Disclaimer! ICMAT solution is wrong.
"mistakes ka bhandar"

Solution:

The data has been provided

Time (Years)	Market Value of Fund	Cash Flows (Net)
0	50	0
0.5	60	-20
1.0	120	—

(a) Calculation of MWROR $\Rightarrow 50 \left(1 + \frac{r}{2} \right)^2 - 20 \left(1 + \frac{r}{2} \right) = 120$

$$\Rightarrow 50 + 50r + \frac{r^2}{4} - 20 - 10r = 120$$

$$\Rightarrow 40r - \frac{r^2}{4} = 90$$

$$\Rightarrow r = 226\%$$

It should be +ve otherwise mkt value 1y can't be 120

Even calculation is wrong

$$50 \times (1 + 0.5r)^2$$

$$50 \times \left[(1)^2 + (0.5r)^2 + 2 \times 1 \times 0.5r \right]$$

$$\text{or } 50 \times (1 + 0.25r^2 + r)$$

$$\therefore 50 + 12.5r^2 + 50r$$

$$\therefore (a+b)^2 = a^2 + b^2 + 2ab$$

(C) TWROR in revised condition:

$$\begin{array}{r}
 \begin{array}{c} | \\ 50 \end{array} \qquad \begin{array}{c} | \\ 60 \\ -20 \\ \hline 40 \end{array} \qquad \begin{array}{c} | \\ 60+100\% \\ =120 \end{array} \\
 \\
 (1+i) = \frac{60}{50} \times \frac{120}{40} = 3.60
 \end{array}$$

$$\therefore i = (3.60 - 1) = 2.60 \quad \boxed{260\%} \quad \underline{\underline{\text{Ans}}}$$

Q-17.2:

$$\begin{array}{r}
 \begin{array}{c} 0 \\ | \\ 90 \end{array} \qquad \begin{array}{c} .25 \\ | \\ 93 \\ +5 \\ \hline 98 \end{array} \qquad \begin{array}{c} .5 \\ | \\ 99 \\ +2 \\ \hline 101 \end{array} \qquad \begin{array}{c} .75 \\ | \\ 105 \\ +7 \\ \hline 112 \end{array} \qquad \begin{array}{c} 1 \\ | \\ 115 \end{array}
 \end{array}$$

(i) money weighted rate of return (mwrOR)

Assume mwrOR = i (for 3m)

$$90 \times (1+i)^4 + 5 \times (1+i)^3 + 2 \times (1+i)^2 + 7 \times (1+i) = 115$$

Rough calculation (Not for exam):

$$\text{Investment} = 90 + 5 + 2 + 7 = 104$$

$$\text{Ending Value} = 115$$

$$\text{Return (4 period)} = \frac{115-104}{104} \times 100 = 10.58\% \quad (\text{i.e. } 2.64\% \text{ for 3m})$$

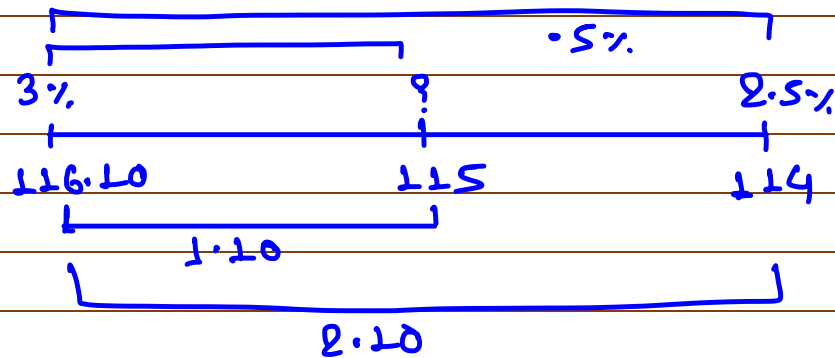
Assume, $i = 3\%$

$$\begin{aligned}
 &90 \times (1+0.03)^4 + 5 \times (1+0.03)^3 + 2 \times (1+0.03)^2 + 7 \times (1+0.03) \\
 &= 116.10
 \end{aligned}$$

Again, assume $i = 2.5\%$

$$90 \times (1+0.025)^4 + 5 \times (1+0.025)^3 + 2 \times (1+0.025)^2 + 7 \times (1+0.025) = 114$$

using interpolation:



$$2.10 \Rightarrow .5\%$$

$$1.10 \Rightarrow \frac{.50}{2.10} \times 1.10 = .26\%$$

$$\therefore i = 3\% - .26\% = 2.74\% \text{ for 3 months}$$

$$(i.e. 2.74 \times 4 = 10.96\% \text{ per annum})$$

(b) Time weighted rate of return (TWRR)

$$(1+i) = \frac{93}{90} \times \frac{99}{98} \times \frac{105}{101} \times \frac{115}{112}$$

$$i = (1.1143 - 1) = .1143 \quad (i.e. 11.43\%) \quad \underline{\underline{\text{Ans}}}$$

(c) mWROR (i.e. IRR) is suitable for an individual fund's performance but not suitable for measuring the performance of a fund manager. Hence, we can say TWRR is better measure of fund manager.